

DATAPORT DIGITAL SERVICE

LOCAL LOOP ACCEPTANCE TESTING

This Section provides procedures to perform acceptance testing on 4-wire local loop facilities intended for use with private line data service.

Whenever this Section is reissued, the reasons for reissue will be listed in this paragraph.

Local loop acceptance testing consists of measuring foreign voltage, insulation resistance, loop resistance, insertion loss (AML), background noise, and impulse noise. These tests are performed to verify engineering calculations; identify faulty cable pairs; and verify the absence of load coils, build-out capacitors, or bridged taps. These tests should be performed as soon as cable pairs are assigned in order to correct any transmission difficulties prior to the service date. All tests are made between the customer station location and the serving D448 multiplex terminal office channel unit dataport (OCUDP).

Procedures for local loop acceptance testing are provided in Chart 1.

Note 1: Acceptance testing requires the presence of craft at both the D448 office and the customer location.

Note 2: Fig. 1 provides a diagram of 4-wire local loop wiring.

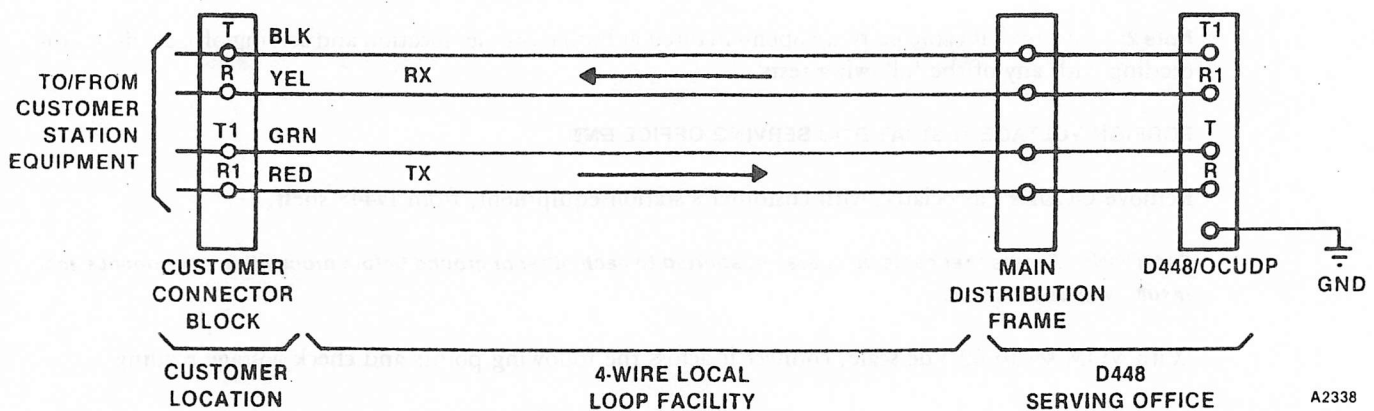


Fig. 1—Local Loop Wiring Diagram

CHART 1

LOCAL LOOP ACCEPTANCE TESTING

APPARATUS

- 1—Volt-ohm meter (VOM) (WE KS-14510, Triplett 630, or equivalent)
 - 1—Double banana plug-to-insulated alligator clips test cord (WE P2ES, Lenkurt 6012A, or equivalent)
 - 2—Transmission measuring set (TMS) capable of operation up to 85 kHz with 135-ohm input/output impedance (Hewlett-Packard HP-3550B or equivalent)
 - 2—Noise measuring set (NMS) with 135-ohm input/output impedance (Northeast Electronics TTS-37B or equivalent)
 - 2—Impulse noise counter (INC) equipped with 50 kHz weighting filters and 135-ohm input/output impedance (Northeast Electronics TTS-58A, WE 6F NMS Impulse Noise Counter equipped with 497F filter, or equivalent)
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STEP

PROCEDURE

Note 1: Perform these procedures for each 4-wire pair selected for private line data service.

Note 2: Ensure that cable pairs are open-circuited at both customer location and serving office before proceeding with any of the following tests.

FOREIGN VOLTAGE TEST (AT D448 SERVING OFFICE END)

- 1 Remove OCUDP, associated with customer's station equipment, from D448 shelf.

CAUTION: Ensure that cable pairs are not shorted to each other or ground before proceeding or erroneous test results will be recorded.

- 2 With VOM set to 60 Vdc scale, connect it across the following points and check voltage reading:

T to R	R to GND
T1 to R1	T1 to GND
T to GND	R1 to GND

Requirement: VOM reads 0 ± 1 Vdc in all cases.

- 3 If voltage reading exceeds requirement of Step 2, repair or replace faulty pair(s).

INSULATION RESISTANCE TEST (AT D448 SERVING OFFICE END)

- 4 Set VOM to OHMS X10,000 scale and zero-adjust meter.
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CHART 1 (Cont)

STEP

PROCEDURE

- 5 Connect VOM across the following points and measure the resistance:

T and R	R and T1
T and R1	R and GND
T and T1	T1 and R1
T and GND	T1 and GND
R and R1	R1 and GND

Requirement: VOM reads greater than 300K ohms in all cases.

- 6 If requirement of Step 5 is not met, repair or replace fault pair(s).

LOOP RESISTANCE TEST

- 7 At customer location *only*, short circuit T/R pair and T1/R1 pair.

- 8 At D448 serving office, set VOM to OHMS X100 scale and zero-adjust meter.

- 9 Connect VOM between T and R and read resistance value.

Requirement: VOM reads less than 4200 ohms. Record resistance measurement on circuit layout record card (CLRC) for future maintenance use.

- 10 Connect VOM between T1 and R1 and read resistance value.

Requirement: VOM reads less than 4200 ohms. Record resistance measurement on CLRC for future maintenance use.

- 11 If requirements of Steps 9 and 10 are not met, repair or replace fault pair(s).

- 12 At customer location, open-circuit T/R and T1/R1 cable pairs.

INSERTION LOSS TEST

Note 1: For the procedures of this test, craft will be required at both customer location and D448 serving office.

Note 2: Perform Steps 13 through 27 at the serving office end of the local loop.

Note 3: Steps 13 through 16 refer to controls located on the oscillator portion of the HP-3550B test set.

- 13 Set the FREQ select switch to applicable test frequency (Table A).

CHART 1 (Cont)

STEP

PROCEDURE

TABLE A

INSERTION LOSS REQUIREMENTS FOR INITIAL INSTALLATION TESTS

BIT RATE (kb/s)	TEST FREQ (kHz)	ACTUAL MEASURED LOSS (AML) LIMITS (dB)
2.4	1.2	$AML \leq 34 \text{ dB}$, and $AML = EML + 5, -2.5 \text{ dB}$
	4.8	$AML \leq \text{twice AML at } 1.2 \text{ kHz}$
4.8	2.4	$AML \leq 34 \text{ dB}$, and $AML = EML + 5, -2.5 \text{ dB}$
	4.8	$AML \leq \text{AML at } 2.4 \text{ kHz} + 15 \text{ dB}$
9.6	4.8	$AML \leq 34 \text{ dB}$, and $AML = EML + 5, -2.5 \text{ dB}$
56.0	28.0	$AML \leq 34 \text{ dB}$ and $AML = EML + 5, -2.5 \text{ dB}$
	82.0	$AML \leq \text{AML at } 28 \text{ kHz} + 20 \text{ dB}$
	48.0	$\frac{(\text{AML at } 28 \text{ kHz}) + (\text{AML at } 82 \text{ kHz})}{2} \pm 2.5 \text{ dB}$

- 14 Set RANGE selector to X1000 for 2.4, 4.8, or 9.6 kb/s service; set RANGE selector to X10K for 56.0 kb/s service.
- 15 Set AMPLITUDE control to minimum (fully counterclockwise).
- 16 Connect one side of oscillator OUTPUT to oscillator ground terminal.
Note: Steps 17 through 19 refer to controls located on the voltmeter portion of the HP-3550B test set.
- 17 Set FUNCTION switch to ON.
- 18 Set RANGE selector to 0 dB.
- 19 Connect black terminal on voltmeter input to voltmeter ground terminal.
Note: Steps 20 through 24 refer to controls located on the PATCH PANEL portion of the HP-3550B test set.
- 20 Set MEAS-CAL switch to CAL.
- 21 Set IMPEDANCE selector to 135 OHMS (both input and output).
- 22 Set FREQ selector to < 5 KC for 2.4, 4.8, or 9.6 kb/s service; set FREQ selector to > 5 KC for 56.0 kb/s service.
- 23 Set DB selector to 0.

CHART 1 (Cont)

STEP	PROCEDURE
24	Connect OUTPUT and INPUT center taps (CT) to the voltmeter ground terminal.
25	Connect HP-3550B test set output to the T/R pair of the local loop.
26	With patch panel MEAS-CAL switch set to CAL, adjust oscillator AMPLITUDE control to obtain 0-dBm reading on voltmeter.
27	Set patch panel MEAS-CAL switch to MEAS.
	Note: Perform Steps 28 through 36 at the customer location end of the local loop.
28	Connect HP-3550B test set input to the T/R pair of the cable with twisted pair.
29	Make connections to ground terminals on HP-3550B per Steps 16, 19, and 24.
	Note: Steps 30 through 32 refer to controls located on the PATCH PANEL portion of the HP-3550B test set.
30	Set MEAS-CAL switch to MEAS.
31	Set IMPEDANCE selector to 135 OHMS (both input and output).
32	Set FREQ selector to < 5 KC for 2.4, 4.8, or 9.6 kb/s service; set FREQ selector to > 5 KC for 56.0 kb/s service.
33	Set voltmeter FUNCTION switch to ON.
34	Set voltmeter RANGE selector to 0 dB.
35	Decrease voltmeter RANGE setting until meter reading is obtained.
36	Read received level and record results at each applicable frequency setting on CLRC.
	Requirement: Refer to Table A.
	Note: The insertion loss (dB) = 0 dBm (transmit level) – received level (dBm). For example, if received level is – 25 dBm, then insertion loss = + 25 dB.
37	Repeat Steps 13 through 36 for T1/R1 cable pair.
	Requirement: Refer to Table A.
38	If test results do not meet requirements, check value of EML found in records. Otherwise, disconnect test equipment at both ends and proceed to BACKGROUND CIRCUIT NOISE TEST.

CHART 1 (Cont)

STEP

PROCEDURE

BACKGROUND CIRCUIT NOISE TEST

Note 1: Background circuit noise measurements should be made during a busy-hour period at the central office (C.O.).

Note 2: Background circuit noise measurements require four 135-ohm resistors to terminate both cable pairs at each end.

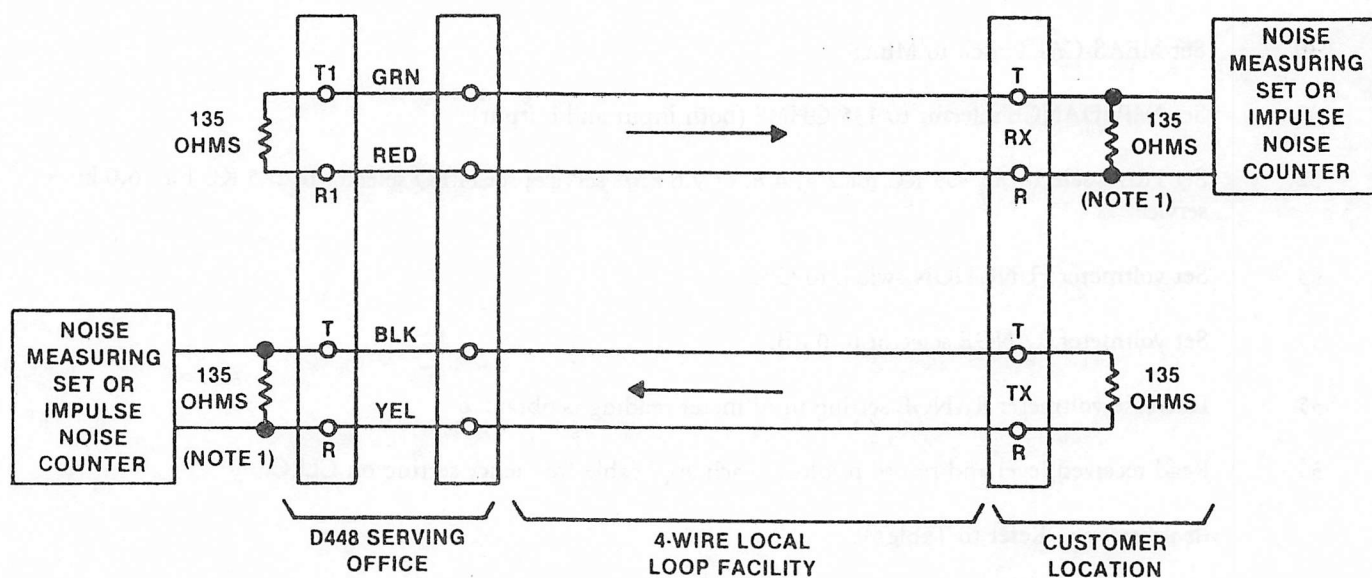
Note 3: Perform Steps 39 through 41 at the customer location.

39 Connect Northeast TTS-37B NMS to the RX T/R pair as shown in Fig. 2.

40 Connect 135-ohm resistor across TTS-37B NMS input.

41 Connect 135-ohm resistor across TX T/R pair.

Note: Perform Steps 42 through 44 at the D448 serving office OCUDP.



NOTES:

1. FOR NOISE MEASURING SETS OR IMPULSE NOISE COUNTERS WITH BUILT-IN 135-OHM TERMINATION, OMIT THIS EXTERNAL 135-OHM RESISTOR.

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Fig. 2—Background Circuit and Impulse Noise Test Connections

CHART 1 (Cont)

STEP	PROCEDURE
42	Connect Northeast TTS-37B NMS to T1/R1 pair as shown in Fig. 2.
43	Connect 135-ohm resistor across TTS-37B NMS input.
44	Connect 135-ohm resistor across T/R pair.
	Note: Steps 45 through 47 are performed at both locations.
45	Set TTS-37B NMS for 600 ohms bridging using 50 kHz (high pass) weighted filter.
46	Adjust TTS-37B NMS per manufacturer's instructions and note maximum noise level.
	Requirement: Refer to Table B.

TABLE B

BACKGROUND CIRCUIT NOISE REQUIREMENTS

BIT RATE (kb/s)	MAXIMUM NOISE LEVEL	
	(dBm)	(dBm)
2.4	42	- 48
4.8	39	- 51
9.6	31	- 59
56.0	28	- 62

Note: Many NMSs equivalent to the TTS-37B (with 50 kHz weighting) have 135-ohm inputs. If using these sets, the 135-ohm resistor bridged across the NMS is not used. To account for the use of a 135-ohm set, add 7 dB to the requirements of Table B.

- 47 If background circuit noise does not meet requirements, repair cable or request a new pair assignment. Otherwise, disconnect equipment at both ends and proceed to IMPULSE NOISE TEST.

IMPULSE NOISE TEST

Note: Perform Steps 48 and 49 at the customer location.

- 48 Connect Northeast TTS-58A INC to RX T/R pairs as shown in Fig. 2.
- 49 Connect 135-ohm resistor across TX T/R pair.

Note: Perform Steps 50 and 51 at the D448 multiplex shelf OCUDP.

- 50 Connect TTS-58A INC to T1/R1 pair as shown in Fig. 2.

CHART 1 (Cont)

STEP

PROCEDURE

51 Connect 135-ohm resistor across T/R pair.

Note: Steps 52 through 55 are performed at both locations.

52 Set TTS-58A INC for 135-ohm termination using 50 kHz (high pass) weighted filter.

53 Adjust TTS-58A INC per manufacturer's instructions for impulse noise threshold given in Table C.

Note: The TTS-58A INC has a selectable 135-ohm termination. For sets not equipped with 135-ohm input, a 135-ohm resistor should be placed across the test set input. To account for use of such a set, subtract 7 dB from the requirements of Table C.

TABLE C

IMPULSE NOISE REQUIREMENTS

BIT RATE (kb/s)	THRESHOLD (dBm)	MAXIMUM NUMBER OF IMPULSE NOISE COUNTS PER 15 MIN
2.4	65	7
4.8	62	7
9.6	54	7
56.0	51	7

54 On TTS-58A INC, reset counter to 00 and make a 15-minute run. At the end of this time, read total number of counts recorded on counter.

Requirement: Refer to Table C.

55 If impulse noise count does not meet requirements, request a new nonloaded pair assignment. Otherwise, remove all test equipment, leads, and 135-ohm resistors from the circuit.

56 Reconnect D448 OCUDP and customer station equipment to 4-wire local loop.

57 This completes acceptance testing of the local loop facility.
